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European naval cooperation – Frigate programmes

REPORT

submitted on behalf of the Technological and Aerospace Committee
by MM González Laxe and Arnau Navarro, Rapporteurs

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¹ Adopted unanimously by the Committee.

² *Members of the Committee.* Mr Marshall (Chairman); MM Lenzer, Atkinson (Alternate Wray) (Vice-Chairmen), Mrs Aguiar, Mr Arnau Navarro, Mrs Blunck, MM Cherribi, Cunliffe, Diana, Mrs Durrieu, MM Etherington, Feldmann, Hunault, Mrs Gelderblom-Lankhout, MM López Henares, Lorenzi, Luis, Martelli, Olivo, Polydoras, Probst, Ramírez Pery, Sandrier, Staes, Theis, Valleix, Mrs Zissi, N ...

Associate members: MM Dincer, Kirathoglu, Yurur.

N.B. *The names of those taking part in the vote are printed in italics.*

Draft Recommendation

on European naval cooperation – Frigate programmes

The Assembly,

- (i) Considering the increasing importance of naval armed forces in European security and defence;
- (ii) Recalling in this connection WEU's contribution to the Gulf war and the embargo in former Yugoslavia;
- (iii) Bearing in mind further that the Falklands war revealed navies' widespread vulnerability to missile attack, leading to new types of frigate design with enhanced anti-missile and anti-air warfare capability;
- (iv) Recalling the NFR90 project, whereby various NATO countries tried to reach agreement on a common frigate design,
- (v) Considering that European naval development can be achieved cooperatively, inside NATO, but taking European defence industry interests into account,
- (vi) Welcoming the various frigate programmes currently under way in Europe, namely TFC (Trilateral Frigate Cooperation) between Germany, Spain and the Netherlands, and the Horizon programme, involving France, Italy and the United Kingdom,
- (vii) Taking the view that cooperation must not be reduced solely to technical and industrial fields but should extend to tactical and operational areas;
- (viii) Recalling in this connection the British Government's decision to make its operational sea-training facilities available to WEU for national or collective use by WEU countries, as the Birmingham Declaration confirmed;
- (ix) Noting furthermore that the definition of a common concept as the basis for genuine cooperation of necessity requires identical scheduling,
- (x) Stressing the importance attached to promoting a culture of cooperation within firms, preferably through involvement in programmes that are straightforward;
- (xi) Considering finally that opening up Euromarfor to other countries wishing to join would constitute a very positive development for that organisation, in view of the fact that its *raison d'être* is bound up with the conduct of Petersberg tasks,

RECOMMENDS THAT THE COUNCIL

1. Set up a Naval Group along the same lines as the Space Group, the objectives of which might be, *inter alia*:
 - to study the future naval requirements of WEU member countries, taking account of Petersberg tasks. Such a study should cover frigates, corvettes, logistic support vessels, submarines, torpedoes, including weapons systems, naval patrol aircraft, marine helicopters and embarked reconnaissance UAVs;
 - to bring schedules into line,
 - to encourage naval cooperation at technical and industrial levels,
 - to develop the Organisation's operational role through the use of existing training facilities,
 - to encourage Euromarfor to open up to other countries,
 - to promote naval training exercises conducted specifically with Petersberg tasks in view

Explanatory Memorandum

(submitted by MM González Laxe and Arnau Navarro, Rapporteurs)

I. Introduction

1. The term "frigate" was reintroduced into naval parlance by the British Royal Navy during the second world war to denote a mass-produced, long-range anti-submarine escort ship¹. More recently, in the 1960s and 70s, frigates acquired by most fighting navies around the world offered capabilities that could be described as generalist, without particular specialisation in a given combat area, or, in other words with limited capabilities in any area of combat.

2. The Falklands war in the early 1980s meant that the vulnerability of these types of ships and of navies in general to Exocet missiles and, by extension, to any anti-ship weapon, was laid bare – which led to a rethink about a new type of frigate.

3. Thus the definition of the new concept for the frigate marked a return to the classic definition as the "smallest warship capable of independent deployment" and that in turn implied effective anti-missile and anti-aircraft capabilities as well as a reasonable anti-submarine defence capability.

4. This gave rise to the NFR90 (NATO Frigate Replacement for the 90s) project which, although it succeeded in drawing the majority of NATO countries, nevertheless failed to get off the ground, as it proved impossible for such a large group of countries to reach agreement when it came to defining a common concept.

5. However this initial abortive attempt nevertheless sowed the seed from which Europe's two current programmes sprang. These are Trilateral Frigate Cooperation (TFC), a partnership between Germany, Spain and the Netherlands, and Horizon, which brings together France, Italy and the United Kingdom.

6. These programmes, as will subsequently become apparent, are far from similar as regards the degree of cooperation involved between governments and industry, the technical specifications of the vessels, their weapons and radar systems and so on, and it is precisely that diver-

sity which, in the Rapporteurs' opinion, makes their study and the reasons that led to the choice of a particular option the more interesting.

II. Cooperation between Germany, Spain and the Netherlands

7. As has already been said, the NATO Frigate Replacement for the 90s (NFR90) ultimately came to grief in the late 1980s because it was impossible for the participant countries to reach agreement on the definition of a common concept. The same thing happened with the NATO Anti-Air Warfare System (NAAWS) programme, the purpose of which was to develop a local area missile system in conjunction with the NFR90.

8. The demise of these programmes did not do away with the need various countries were expressing to procure frigates with air-defence capability. Germany and the Netherlands, joined later by Spain, therefore agreed on a new programme known as Trilateral Frigate Cooperation or TFC.

9. It was agreed right from the start of the cooperation programme that its purpose was not joint construction of vessels but obtaining the most cost-effective outcome in terms both of procurement and life-cycle cost. This left countries free to choose their own preferred solutions. This three-way cooperation is in fact confined to the ship's platform and does not extend to systems installed there.

10. Cooperation therefore takes place in areas where it is possible and feasible, which meant that Spain was able to join the programme, although it is not involved in developing the Anti-Air Warfare System where cooperation is restricted to Germany and the Netherlands.

11. The cooperation agreement envisages each country building its own frigates to independent but largely homogenous design. Joint procurement has been agreed in some areas to secure the best prices and development costs are shared.

12. In January 1994 a memorandum of understanding (MOU) on the definition phase was signed by the three countries. This phase was

¹ *Naval forces*, 2/97.

undertaken independently by each of the partners although meetings were held at regular intervals during which attempts were made to hammer out solutions in common, joint specifications were produced, information exchanged and areas of cooperation identified

13. The TFC concept is therefore a project where each country builds similar ships with national variants, on the basis of partial cooperation and taking advantage of synergies produced through shared engineering experience, joint definition and procurement of equipment and specific collaboration over combat systems

14. The agreements reached on the definition phase have resulted in firm cooperation between the three governments on the basis of an MOU signed between their respective navies and industrial collaboration through agreements signed in September 1994 between ARGE (Germany), Bazán (Spain) and Royal Schelde (Netherlands) with a view to joint definition of equipment, cooperation over detailed platform studies and the framing of a joint strategy for shipyards for construction of the combat system

15. We shall now turn to discussion of the particular characteristics of each of the frigates, for which Germany has already signed a contract for three, with an option on a fourth, while Spain and the Netherlands are to build four vessels apiece.

Germany's F-124 frigate

16. Following cancellation of the NFR90 programme, in 1990 Germany and the Netherlands signed a Memorandum of Understanding on Naval Ship Cooperation (MOU NSC) which laid down the basis for cooperation between the two countries in the field of "naval research, development, procurement and life-cycle support, wherever the Nations identify a benefit from co-operation".

17. Frigate requirements, schedules and costs were reviewed over a two-year period to ascertain whether cooperation could be beneficial. During that time the definition changed from that of a multi-purpose frigate with special anti-submarine warfare capabilities to that of a frigate whose primary role was anti-air warfare cover for task force protection.

18. In this two-year long process (1992-93), Germany and the Netherlands identified a com-

mon need for frigates, harmonised their frigate requirements, defined a joint approach to the weapons and sensor suite, agreed a common superstructural layout for the frigates, giving rise to an almost identical design study, and an approach to the combat direction system (CDS) which made joint software production possible – resulting in effective cost-sharing with consequent reductions in each nation's costs and harmonised and synchronised schedules for frigate production.

19. In 1994, as stated previously, Germany, Spain and the Netherlands signed an MOU on common definition of their frigates. According to the German authorities the underlying principle was to identify, during project definition, potential areas of cooperation likely to give rise to development work, draw up a joint procurement list of as many items as possible and agree a procurement programme for the three nations and, where appropriate, shares in any development work necessary.

20. The approach here consisted in agreeing common solutions as far as possible in terms of ship design, standards and rules and regulations, both in order to achieve real cost savings and avoid imposing overly specific solutions, working methods or other constraints. In this way it was possible to put in place a highly cost-effective national construction process incorporating the maximum number of common elements

21. Germany formed a company to build the ARGE F-124 frigate consisting of Blohm und Voss GmbH, as the leading yard, Howaldtwerke-Deutsche Werft AG and Thyssen Nordseewerke GmbH

22. The outcome of the definition phase (1994-95) was as follows: national procurement preparation in all three countries, joint specifications for items in common, thus allowing the various government organisations to set to work building frigates equipped in the same way, in the case of Germany and the Netherlands identical weapons, sensors, CDS and platform components, methods and technical standards, a common tendering process for identical items, joint development by Germany and the Netherlands of some components for the multi-function radar system (APAR or Active Phased Array Radar) and related fire-control software and for the AAW (Anti-Air Warfare) system including

integration of the SM-2 missile, development of the ESSM (Evolved Sea Sparrow Missile) with ten other NATO nations and further information and status exchanges between firms and governments.

23. The procurement process started in June 1995 with the signing of the contract for construction of the Dutch frigate, followed in March 1996 by Germany's F-124 frigate and the Spanish F-100 in February 1997. All procurement contracts secured parliamentary approval.

24. The MOU for the development of the APAR multi-function radar was signed by Germany, the Netherlands and Canada in 1995 and in 1996 the same three countries also signed the MOU for the AAWS with integration of the SM-2 missile. Lastly, 1996 also saw the signature of the trilateral MOU between Germany, Spain and the Netherlands for the DD&C (design, development and construction) phase.

25. The F-124 has a CDS (combat direction system) that uses a real-time database and integrated communications network with 17 multi-functional consoles and processors, 2 large-screen tactical displays, 12 bus interface units, a Cosmos monitor, a redundant databus and distributed processing.

26. The F-124's anti-air warfare system consists of APAR – a multi-function, static-face radar with the latest in miniaturised, integrated transmit/receive modules, medium and long-range SM (Standard Missile)-2 Block IIIA anti-air missiles and, for the future, Raytheon and Hughes's ESSM although with a different guidance system to that used by the United States. The missiles will be fired from a VLS MK-41 32-cell launcher. The F-124 will also come equipped with two Rolling Airframe Missile (RAM) launchers and two quadruple Harpoon missile launchers and will carry a traditional Smart-L long-range radar.

27. The degree of cooperation over the air-defence system the countries involved in the trilateral programme maintain with the United States is striking. Apart from Spain's choice of the Aegis system, to be discussed in a later section of this report, other examples of such cooperation are the ESSM (Raytheon-Hughes), the MK-41 VLS, the SM-2 and related software, the SM-2 algorithms and software packages, all of

which involve the three partner countries and the United States, and the RAM (Rolling Airframe Missile) involving the latter and Germany.

28. The F-124 will also have two triple MK-32 torpedo launchers and helicopter-borne long-range light-weight torpedoes. Additionally it comes equipped with an Oto Melara 76 mm gun and two Rheinmetal 20 mm guns.

29. The flight-deck and hangar accommodate two on-board NH-90 helicopters. The two hangars are separated by a passageway for fire protection. The helicopters are supported by a fully-equipped and stocked maintenance workshop, a briefing room and helicopter handling equipment.

30. The Helicopter Handling System from MBB-Forder und Hebesysteme uses laser-guided and computer-controlled manipulator arms to secure the helicopter after landing. The system, handled by a single operator from a portable remote control handset, allows the helicopter to be transferred to a hangar without manual intervention. The helicopter flight-deck is rated to accommodate a 15-ton class helicopter, such as a Merlin, for fuelling and torpedo loading.

31. The F-124 uses a CODAG (combined diesel and gas) propulsion system. In diesel mode, the ship has an operating range of 4 000 nautical miles at a cruising speed of 18 knots. In combined diesel and gas propulsion mode the ship can reach a maximum speed of 29 knots².

32. Lastly the ship's measurements are as follows: length: 131.5 m, beam: 16.5 m, displacement: 5 860 tons. The ship has a complement of 243.

Spain's F-100 frigate

33. The F-100 programme had its origin in the Alta Mar Plan which established the Spanish Navy's frigate requirement at 15 ships. Thus Spain was actively involved in the NFR90 programme until the latter was cancelled in 1989 owing to the complications of carrying out a project of that kind with such a large number of countries.

34. The F-100 programme started at that juncture. It sought to take advantage of the ex-

² Website for the Defence Industry - Navy
<http://www.naval.technology.com/projects/f124/index.htm>

perience and know-how gained with the NFR90 project, by continuing the manifold progress achieved in the construction of Spain's second FFG frigate series – the Santa María F-80 Class (Navarra F-85 and Canarias F-86)³. Thus, the aim was to take full advantage of Spain's industrial potential, and especially its military shipyards where Spain had notched up a number of notable successes.

35 In 1990 the Spanish Navy and the military naval construction yard, Bazán, began the pre-feasibility phase and drew up the initial operating specifications for construction of four frigates of 3500-4000 tons. This first study looked at various alternative solutions for the ship's platform, combat system, propulsion system etc. and ended up raising displacement to 4 500 tons to conform more closely to Navy requirements.

36. The study also revealed the need for external cooperation, with the aim of cutting down on technology risks and costs. Thus possibilities for European cooperation in specific areas like the combat system and equipment procurement were considered. Talks then began with Germany and the Netherlands (Spain's earlier partners in the NFR90) which were going ahead with their plans for new frigates and which, in the Spanish authorities' view, offered opportunities for flexible and hence more realistic and feasible cooperation.

37 In November 1993, the Bazán, Royal Schelde and Blohm und Voss naval yards signed an agreement to collaborate in the development and construction of the various ship's platforms, shortly afterwards the defence ministers of the three countries concerned signed the MOU on cooperation over the definition phase. Moreover at the same time Spain's Indra group signed an agreement with the Dutch firm Signaal in connection with the APAR (Active Phased Array Radar)-based combat system being developed jointly by Germany, Canada and the Netherlands.

38 The F-100's definition phase ended in July 1995 and, from Spain's point of view, trilateral cooperation throughout that period was regarded as entirely satisfactory, both at government and industry level. However, during that phase the AAW (Anti-Air Warfare) segment was identified as the most complex part of the programme and

the Spanish Navy decided that to adopt the APAR system, which, as noted previously, was then in the development phase, would introduce uncertainties over both costs and schedules. Uncertainty over costs had no place in the Spanish tendering system under which programme costs had to be known from the outset while the prospect of a slippage in schedules militated against Spain's urgent need for new frigates within the shortest possible time-frame.

39 In addition, Spain regarded as unacceptable the risks inherent in modifying the guidance system for the SM-2 missiles chosen for the F-100 frigate to make it compatible with APAR. It would basically have been necessary to run system acceptance trials and this would have held up the programme.

40 These various considerations led the Spanish authorities to pull out of joint development of the anti-air system with Germany and the Netherlands in June 1995 and turn their attention to a solution based on the US Aegis system. This necessarily entailed extending the programme's definition phase for a further year in order to adapt it to the new anti-air system.

41. In March 1997 construction began of the four frigates, at a total cost of 280 billion Spanish pesetas, approximately 100 billion of which were earmarked for foreign procurement of equipment for which Spain does not have 100% home-grown development capacity or whose domestic manufacture in limited series would not be profitable.

42 Net gains on joint production, trade-offs and technology transfers for this type of foreign procurement would be over 91%.

43 Foreign industry involvement will mainly be concentrated on the combat system based, as stated, on the Aegis system, with Lockheed Martin as the main supplier. The Spanish industry will mainly be involved in the production of the ship's platform and specific equipment for the combat system.

44. The review *Naval Forces*⁴ opines that Spain's choice of Aegis for its two F-100 frigates represents a new phase in the system's evolution as an international programme, as the F-100's combat system includes Spanish sensors and

³ *Revista Española de Defensa (RED)*, March 1997

⁴ *Naval Forces* 1/1997/Vol. xviii

weapons, a Spy-ID radar and a Spanish combat direction system. Thus Spain is the first country to produce major Aegis system components outside the United States.

45. In designing the combat system for the F-100, Spain looked to that of the US *Arleigh Burke* destroyer, adapting it to Spanish operational requirements. The aim of the process is to produce a home-grown operational command and control system, which, together with the Aegis system, would make possible total integration of all the sensor and weapons subsystems, irrespective of whether they were produced inside or outside of Spain.

46. Thus the main feature of the F-100 Combat Direction System is that it ensures easy, rapid interconnection between different types of on-board equipment, providing compatibility between those of Spanish and US manufacture. Spanish companies involved in the production of the combat system are Indra, Samsel, Fábrica de Artillería de Bazán (FABA) and Enosa.

47. The combat system consists of four main segments⁵: an anti-aircraft system, the basic component of which is the Aegis system, responsible for the search, detection, identification and monitoring of targets, firing and guidance of anti-aircraft missiles and control of the interceptor aircraft themselves. The core of the system is the AN/Spy-ID three-dimensional long-range radar and the MK-99 illuminators for missile guidance. Weapons systems include the 48-cell MK-41 vertical launcher for the SM-2MR and ESSM short and medium-range missiles and a Meroka 2B gun combined with a RAN30L/K detection radar system.

48. The F-100's anti-submarine warfare segment consists of DE-1160 LF ship's sensors, helicopter-installed Lamps III SH-60B sensors (for Sikorsky SH-60 Seahawk helicopters) and MK-46-5 torpedoes capable of being launched from ship or helicopter.

49. The F-100 is also equipped with a Harpoon surface-to-surface missile system and an MK-45 gun associated with a DORNA fire control system. This artillery assembly is designed to provide the vessels with better fire-power against coastal defences.

50. Finally, the fourth component of the frigate's combat system is its electronic warfare capability. The F-100 will have Elnath MK-9000 communications and an Aldebarán radar set and MK-36-2 chaff launchers.

51. The vessel in its final version is quite different to that envisaged at the outset. It is now 133.2 m in length, with a beam of 17.5 m and displacement of 5 760 tons. It is fitted with a CODOG propulsion system giving it a maximum speed of just over 28.5 knots. It will have a complement of 250. The F-100s are due to enter into service between 2002 and 2007.

The Dutch LFC Frigate

52. In the 1980s the Netherlands Navy also joined the NATO Frigate Replacement for the 90s (NFR90) programme to design new air defence and command frigates, with the intention of using the new design to replace the two existing guided-weapon frigates, *Tromp* and *De Ruyter*. These ships act as AAW-platforms and command ships for naval task forces. The ships were designed in the 1960s and commissioned in the 1970s. They are equipped for air defence with Signaal-manufactured 3D long-range air-surveillance radar and US-produced Tartar and NATO Sea Sparrow missiles.

53. The Netherlands also joined the NATO Anti-Air Warfare System (NAAWS) programme for the development of a local area missile system for the NFR90. The programme was to incorporate development of a multi-function radar, an agile short-range missile and an AAW core system.

54. The NFR90 and NAAWS programmes collapsed at roughly the same time the Berlin wall fell and the Netherlands Navy was left with a requirement for new air-defence frigates and no programme with which to fulfil it. A new programme was therefore initiated in cooperation with Germany. When Spain subsequently joined, it became known as Trilateral Frigate Cooperation (or TFC).

55. A decision was taken at the outset of the programme that its aim was not joint construction of ships but the pursuit of cost-effectiveness in terms both of procurement and life-cycle costs. Each nation consequently retains the freedom to choose its own preferred solutions. However, where cooperation is possible and feasible it is of

⁵ *Revista Española de Defensa (RED)*, No. 119-120, 1998.

course pursued. Hence Spain can continue to be part of the TFC-programme despite having opted out of the joint AAW-development

56 In the Netherlands the new frigates are known as Luchtverdedigings- en Commando-Fregatten or LCFs, which stands for air-defence and command frigates. The Netherlands is to build four such ships.

57. Germany and the Netherlands decided to cooperate on developing the AAW system in conjunction with the TFC programme. A development contract for this integrated system was signed in June 1997 with the Netherlands as the contracting authority and Signaal as prime contractor.

58 The principal components of the joint AAW system are

- the APAR multi-function radar,
- a long-range infrared search and tracking system, known as Sirius,
- the Smart-L long-range air surveillance radar;
- the AAW software;
- the MK-41 vertical launch system used to fire both short-range Evolved Sea Sparrow missiles and medium-range standard missiles;
- two MK-31 guided missile systems for Rolling Airframe Missiles (in the German system only),
- two Goalkeeper systems (in the Dutch system only).

59 The development of the active phased array radar (APAR) is a multinational effort with the Dutch Government again as contracting authority and Signaal as prime contractor. Work-share subcontractors have been selected in the participating countries, Canada and Germany, on the basis of costshares

60. APAR development began in the latter half of the 1980s. Following the demise of the NAAWS programme, a technology demonstrator for an X-band active phased array radar was built in the Netherlands. The programme, known as EXPAR, demonstrated the feasibility of the concept. APAR project definition started in mid-1993 and ended in late 1995 and the project has

now entered its engineering and manufacturing development phase, due to continue until early 1999

61 APAR will be able to perform a number of functions simultaneously. These comprise horizon search, a limited volume search, accurate tracking of over 100 air targets and provision of support to defending missiles through mid-course guidance and terminal illumination. The system is primarily designed to defeat very low-flying stealthy anti-ship missiles and very high-flying supersonic divers. Apart from its air-defence functions, APAR will also have a role in surface warfare, carrying out surface search functions and providing fire control for the gun system.

62 APAR will be capable of use in both blue water and brown water operations. Hence it will be a pulse Doppler system with a large bandwidth and high resolution. In terms of missile support, it will be capable of sending modulated uplink messages and providing interrupted terminal illumination. The system is capable of handling a number of engagements per face in the same time frame.

63 The Netherlands, in conjunction with Germany, is investigating how APAR should be used to control defending weapons against ballistic missiles. The research was carried out by the Applied Physics Laboratory of the Johns Hopkins University with support from the US Navy and American missile contractors. The antenna consists of four static faces providing 360° coverage. Each plate consists of roughly 3 000 transmit/receive modules.

64 Sea Sparrow and SM-2 are semi-active homing devices. However as active phased array radar is not capable of providing continuous wave illumination, a number of development programmes have been started with US Navy support. These should result in an X-band uplink system for the Evolved Sea Sparrow Missile and a special form of terminal illumination (interrupted continuous wave illumination) for both ESSM and SM-2. The SM already has an X-band uplink provision. Simulations, including 6-degrees-of-freedom simulations, have shown the feasibility of the concept and development is under way. The Hughes Company in San Diego is developing fire control software alongside this activity.

65 Smart-L was developed by Signaal under a Dutch government contract. The design is based on the S-band Smart system in use on board the Dutch M and L and the German F-123-class frigates. Under the terms of the development contract, Signaal will deliver a pre-production model. Factory acceptance of the PPM took place last year with satisfactory results. Smart-L will be used as a volume search radar and to carry out fighter control on board air-defence and command frigates.

66 Smart-L is an L-band long-range pulse Doppler surveillance radar. Like APAR, its design is optimised for defence against low-flying, low-observable threats and very high-flying targets in a coastal environment. The system can detect very small targets and, owing to that capability, Smart-L could detect birds as real targets, which is a problem in a littoral environment. Therefore the system is equipped with a filter based on the Doppler spectrum to eliminate bird contacts.

67 The antenna consists of 24 horizontal linear arrays, each consisting of 48 dipoles. Of those 24, only the top 16 are used for transmission. On reception, the 24 arrays are used to create 14 stacked beams to provide altitude information. Under normal operation the system emits a fan beam, while under jamming conditions it can emit a narrow high-power burn-through beam. It therefore also has a part to play in ballistic missile defence, as this type of beam can be emitted up to even higher elevations.

68 The Netherlands cooperates with Canada in the development of Sirius. Canada acquired substantial experience through the joint development with the United States of a system known as AN/SAR-8 and the Netherlands has learned a good deal from the development of the IRSCAN-system. The Sirius system has two optical heads.

69 As part of the AAW system Sirius will perform several tasks. It will supplement APAR under adverse radar conditions; it will provide continuous horizon coverage and, by providing accurate angle measurements, will be a major asset in the fusion of sensor data on low-flying targets; and under conditions of radar silence, it will obviously provide passive surveillance.

70 At the present time a pre-production model is under contract. Delivery is envisaged for the

second half of next year when a programme of both warm and cold-weather land and sea-trials will begin.

71 According to a Netherlands Defence Ministry statement, total procurement costs for the four Dutch Navy LCF frigates will be 1.61 billion dollars⁶. Contracts for the vessels, which are to be built by Royal Schelde, were signed in June 1995 and February 1997.

72 The Royal Netherlands Navy (RNLN) will procure and integrate the various components which are to form the LFC's sensor, weapons and command system. The RNLN Centre for the Automation of Weapon and Command Systems will develop the required software and Royal Schelde will install the sensor, weapons and command system on board.

73 McDonnell-Douglas Harpoon anti-ship missiles are already on order through Foreign Military Sales, while refurbished ex-Canadian Navy 127 mm main guns are being ordered from Otobreda. Other major weapons systems such as the SM-2 Block IIIA and ESSM are being procured separately.

74 The LCF will measure 130.2 m in length and 16.9 metres in breadth, with a displacement of 5 840 tons, and it will have a CODOG propulsion system.

III. Cooperation between France, Italy and the United Kingdom

The Horizon programme

75 France, Italy and the United Kingdom were also involved in the NFR90 programme designed to meet the requirement of many western navies for a frigate with effective anti-aircraft capability. The project collapsed, as stated previously, basically because the variation in the requirements of the participant countries compromised the viability of the project, particularly in financial terms.

76 Nevertheless the existence of certain objective needs, the pressure of cut-backs in defence budgets both on account of the economic climate and owing to the demise of the Soviet bloc, led initially to France and the United Kingdom, joined shortly after by Italy, to consider the

⁶ *Jane's Defence Weekly*, 23 July 1997.

idea of cooperating in the procurement of a single class of frigates designed for anti-air warfare. Thus the Horizon programme came into being.

77. Horizon is an ambitious programme. According to Commander Michel Perchoc⁷ this is true from several different angles, and particularly from an operational point of view, as it aims to provide three navies, each with different naval assets, with a single air-defence vessel, starting from the present situation where European navies have up to now been exclusively dependent for medium-range anti-air warfare systems on equipment supplied by the United States.

78. From a technical point of view, the foreseeable growth in the threat of increasingly high-performance anti-ship weapons, will necessarily mean that defence systems skip a generation, the more so, as the choice of a main weapons system based on the Aster missile means that there must be coordination between the Horizon programme and the Franco-Italian FSAF programme⁸.

79. It is also an ambitious programme as far as cooperation is concerned since there is a joint organisation in London for the Horizon programme and in Paris for the PAAMS (Principal Anti-Air Missile System), bringing together representatives from military staffs and procurement services, as well as an industrial structure to develop the main programme systems.

80. Finally, it presents a major challenge from a financial point of view since the aim is to commission some 20 ships of this particular frigate class, an event that constitutes a European milestone. The programme entails a financial commitment of the highest order, shared on an equitable basis between the arms manufacturers of the three nations, and one that has to be compatible with the spending power of those countries, which are at present subject to severe budgetary restraint.

81. Commander Perchoc considers that although points of view can often differ even between only three participants, a firm resolve exists to meet joint needs, regardless of individual interests. This demands a strong management structure, as far as both government and industry

are concerned, which may mean longer schedules than are desirable but seems nevertheless to be an essential prerequisite for the success of the programme.

82. Joint operational needs have been analysed in the light of three possible scenarios for frigate deployment:

(a) as escort to an air and sea task force based around an aircraft carrier. The frigate's tasks would consist of area defence and guaranteeing command and anti-air warfare functions,

(b) within an unarmed or merchant vessel formation. In this instance the frigate would be capable of exercising tactical command of a naval force (OTC – Officer in tactical command function) and must provide full protection to neighbouring vessels (local defence)

(c) sailing solo in an operational setting, as in the following type of missions:

- a deterrent presence off friendly coasts in low-level crises,
- patrolling areas of moderate risk,
- operations where marine blockades are involved,
- tracking or marking suspicious or hostile craft,
- evacuation of nationals and friendly citizens from countries where there are disturbances.

83. The starting point for such cooperation was, as indicated in the document the *Rapporteurs* were sent by the Horizon Programme Office, agreement on a common military requirement on the part of the Navy Chiefs-of-Staff of the three countries involved. According to the same document, the Chiefs-of-Staff were continuing "to pay regular attention to this programme, in order to ensure, *inter alia*, that the expression of the military requirement continues to reflect a genuine common interest".

84. Thus the three Defence Ministers signed an MOU in London on 11 July 1994 setting out the main principles governing the programme. This was supplemented by a preliminary document signed at the same time as the MOU and

⁷ *Cols Bleus* No 2370, 2 November 1996.

⁸ Assembly Document 1588 – *Transatlantic cooperation in European anti-missile defence – Part II*, Rapporteur: Mr Atkinson.

then by a first supplement, also signed by the three ministers in March 1996 dealing with funding for the first of the two phases – the Definition Phase (1) and the Built Phase (2) – into which the programme is broadly divided. Supplement 1's content specifies the nature of the work to be undertaken, the procurement strategy to be followed and the cost and schedule to be met.

85 A second supplement setting out the basis for phase 2 is being prepared and could be completed in late 1998 for signature in early 1999

86. According to the Horizon programme management, the philosophy forming the basis of the programme is strongly influenced by the lessons learned from the NFR90 programme, especially with regard to defining the framework for cooperation to meet the prime objective of making substantial savings. That philosophy rests on seven main principles laid down by the military staff and procurement authorities of the countries involved, unfailingly supported "by a strong political will"

87 Reference has already been made to the first of those principles, the existence of a common military requirement, as the starting point for cooperation. The second refers to the willingness of the participants to commit themselves in the long term. Again according to the Horizon programme document, the project has been built up on the basis of an overall perspective of the problem encompassing not only all of the phases concerned in the design and building of the ship but also the operational and in-service phases – making it necessary for participating nations to have a long-term commitment so that solutions can be developed that offer financial benefits throughout the life of the ship and providing the industry with the visibility it needs to encourage it to restructure

88 The third is the signing of a single cooperation agreement for development, and construction of in-service support for a single class of frigate. This does not include PAAMS procurement which is covered by a separate cooperation programme between the three countries.

89. In addition to the aspects mentioned in paragraph 84, this agreement specifies the management structure for the programme, cost and work-sharing rules, rules on selection of

equipment, regulations on safety and the protection of information and on the legal arrangements governing the rights and obligations of each of the participants

90. The fourth principle deals with the constitution of integrated management teams with real delegation of authority. On the government side, supervision of the programme (except for PAAMS) has been entrusted to a Steering Committee made up of representatives of the procurement services of the three countries. Nominated by the military staff, the operational authorities for their part form a Naval Committee and are represented on the Steering Committee.

91 Responsibility for the conduct of the programme lies with the JPO (Joint Project Office) reporting only to the Steering Committee. Working alongside the JPO is the ORST (Operational Requirement Staff Team) made up of officers from the three military staff. These two key agencies are in constant touch

92. The organisational structure of the JPO is such that authority and responsibility in each field rests with one individual, thus avoiding the grid-locks in the decision-making process that can occur in programmes where posts overlap.

93 In terms of industrial organisation, an international consortium, the IJVC or International Joint Venture Company, was formed in February 1995 from the French Direction des Constructions Navales – International (DCNI), the Italian Orizzonte SpA (a 50/50 venture between Fincantieri and Finmeccanica) and GEC-Marine of the UK, designated as the industrial prime contractor for the project.

94 It was felt necessary to entrust the overall contracting authority for the project to a single company (IJVC) which would have sole responsibility for supplying the ships in accordance with the required specifications and within the agreed schedule and costs. The contract covers the following items:

- design definition and detailed design of the ship,
- construction of the propelled hull,
- supply and integration of the combat system;
- delivery of combat-ready ships meeting the required operational and technical performance specifications

95 There are three main types of equipment: those items, few in number, which are government-supplied, the most notable of which is PAAMS, of which more will be said in due course

96 Then there are the systems to be developed such as the combat management system (CMS), the fully integrated transmission system (FICS) and the electronic warfare system (EWS) for which industry in the three countries has been asked to group together initially to compete for the design definition phase, culminating in the selection of the consortium to be responsible for carrying out development and production during the second phase. The three countries intend to transfer the contractual responsibility for development and production of these three systems to the IJVC, which will act as the prime contractor for the entire ship, from the start of the second phase – provided the IJVC convinces the JPO that it offers the best value for money and an adequate performance guarantee.

97. Industrial consortia comprising firms from all three countries have come together for the definition phases for each of the three systems. For the CMS the two consortia present consist on the one hand of Bae SEMA, Thomson-CSF and AESN and HCF System France, Datamat, and Ferranti Naval systems on the other. For the FICS there are consortia consisting of Elmer (MAC), Thomson-CSF, Redifon and GEC Marconi on the one hand, and Italtel, Siemens-Plessey, Racal Radio, Bull and Dassault Electronique on the other. Lastly, the two consortia involved in the EWS consist of Thomson-CSF, Dassault Electronique, Marconi and Elettronica on the one hand and Racal, Alenia and CS Defence on the other.

98 This process has faced a fair number of difficulties of all types. Thus *Defense News*⁹ reports that the delay in awarding the contracts for development of the EWS is due to the fact that “according to a senior British industry official there has been no government cash for Horizon EW for three years”, placing the industries of the three countries in increasing difficulty. Up to now each of the six firms forming part of the two consortia have spent half a million pounds of their own money supporting teams of highly trained staff. British managers

have reportedly put forward the suggestion of entering a single joint bid as a way of avoiding even greater losses if the problem cannot be settled immediately.

99. Lastly, a third category of equipment is that not requiring development financed from the Horizon programme. This is to be procured by competitive tender for equipment that exists on the market.

100 The fifth principle on which the programme philosophy is based is that of systematic recourse to competition and maximum use of existing solutions and facilities. The sixth can be described simply as strict cost control and provides that no detailed pre-determined sharing of work is to be organised between the industries of the participating countries, an attempt will be made only to achieve a broad overall balance of the industrial loading of the three countries throughout the programme.

101 The last principle states that there are to be no national variants, other than those expressed in the operational requirement as necessary for easy integration into the respective countries’ fleets. Measures have been taken to avoid the introduction of new variants which would increase costs exponentially for any country that did so and reduce volume effects for the others.

102. It has been agreed by the three countries, with regard to the frigate’s anti-aircraft system, weapons and sensors, that the elements making up its Principal Anti-Air Missile System (PAAMS), in particular Aerospatiale’s Aster 15 and 30 missiles, will be common to all of them. France and Italy are to use Alenia’s multi-function rotatory radar EMPAR and the United Kingdom Siemens-Plessey’s Sampson new-technology radar with miniaturised integrated transmit/receive modules.

103 The French and Italian frigates will also carry missile launchers developed by both countries, while the United Kingdom has opted for the MK-41 vertical launcher. All frigates are to carry traditional long-range Smart-L radar.

104 The Memorandum of Understanding (MOU) for the launch of the PAAMS programme, which, as mentioned previously, has its headquarters in Paris, was signed by the three countries in March 1996. Shortly afterwards a

⁹ *Defense News*, 11 May 1997

joint-venture company, EuroPAAMS, was formed between Eurosam, with a two-thirds equity share, and UKAMS with one third, comprising six partners: Aerospatiale, Alenia, Thomson-CSF Airsys, British Aerospace, GEC Marconi and Siemens-Plessey¹⁰. Installation of the system and integration on board the frigates is scheduled to begin in 2004.

105. The EuroPAAMS consortium is responsible for industrial production of the anti-air defence system for the frigates. The system variants referred to earlier for the French and Italian Navies will be built by Eurosam and those for the Royal Navy by UKAMS.

106. PAAMS combines the British requirement for local area defence with the requirements identified by France (self-defence system) and Italy (medium-range area defence system). In any event the British decision to adopt the Sampson multi-function radar solution has affected the entire programme as France and Italy opted for Thomson's ARABEL radar (on which the fire-control system is based) and EMPAR (fire control) which are already undergoing extensive shipboard tests and are expected to enter production soon. Sampson is at present little more than a technology demonstrator¹¹.

107. Lastly, the choice of a different multi-function radar necessarily implies a whole series of changes to the combat management system (CMS) and the electronic warfare system (EWS) to mention only the most salient. In all likelihood, these difficulties lie behind the decision of the PAAMS programme management team not to provide information about the development of the programme direct to the Rapporteurs.

108. Horizon frigates will have a displacement of 6 500 tons, an overall length of 148.4 m, a beam of 19.9 m, a maximum speed of 29 knots and a range at a speed of 18 knots of 7 000 nautical miles. The ship will accommodate 235 crew.

109. Initial forecasts suggest that the United Kingdom will buy 12 frigates, Italy 6 and France 4, although such figures, especially those for the United Kingdom and Italy are quite unrealistic

and a more reasonable estimate would be 6 or 8 for the Royal Navy and 2 for Italy and France, although the latter two countries could possibly buy one or two more at a later date.

IV. Conclusions

110. Throughout the present report, we have examined two cooperation programmes, the underlying thinking, working methods and final aims of which differ quite widely. For this reason, it is difficult to draw conclusions that hold good for two such different types of project, neither of which are the product of whim or hazard, but the outcome of a long and carefully-considered process. It would therefore perhaps be most appropriate to formulate a number of general considerations that could apply to either of them and also draw attention to the particular features of each that might serve as examples in future collaborative ventures.

111. First, to state the obvious, schedules must be identical – an essential condition for definition of a design of a greater or lesser degree of commonality.

112. One conclusion that might be drawn from trilateral cooperation is that results are achievable within stringent scheduling requirements and that common developments can be agreed on in line with the funds made available by each participant. There is no need, according to the three countries taking part in the TFC programme, to build identical ships. Extensive information exchange on design preparation with each country adopting its own optimum design solutions, has proved a better approach for the trilateral partners. The results achieved have shown that there is no need for a heavily-staffed international design office. National organisations continue to work as normal, with some extra posts being created for specialist staff, who also act as liaison officers, working from small joint offices.

113. As far as subsystems requiring development are concerned, these need to be located in a multinational framework from the first phase and cooperation in areas covered by a given industrial policy must be based on medium- and long-term criteria.

114. It also seems desirable to try and stimulate a culture of cooperation within firms, preferably through involvement in programmes which are relatively straightforward or where success is

¹⁰ *Revue Aerospatiale* 134, December 1996-January 1997.

¹¹ *Naval Forces* 2/97.

guaranteed by the status of the country acting as the driving force, as is the case with the United States and the ESSM (Evolved Sea Sparrow Missile).

115 A problem common to both cooperation programmes is the differences between the various national procurement systems which are based on different regulations and working methods. In the case of the Horizon Programme, transfer of responsibilities from the national sphere to the JPO proved difficult and the programme management itself drew attention to the danger of the JPO appearing to be a "fourth nation" with its own agenda to pursue. The JPO must remain, and be understood as, the organisation acting for and on behalf of the nations and forming an integral part of their own organisations

116 It should also be noted that Horizon is undoubtedly one of the most important cooperation programmes ever tackled in Europe, not simply in terms of its size, but also because it represents cooperation in the wider sense of the word, involving an unrelenting search for consensus on major decisions – a factor that has at times hampered the programme's advance and on several occasions been the cause of delays in schedules.

117 Furthermore the JPO's lack of legal personality has deprived it of a number of means that would have facilitated both its creation and its mode of operation, as Document 1419 submitted to our own Assembly has already pointed out¹²

118 Lastly, the Horizon Programme management considers it premature to draw definitive conclusions from its experience, even though it regards it as extremely useful. It could undoubtedly prove useful in defining principles for the future management of programmes

119 The countries involved in TFC point to the programme's flexibility as one of its salient features and one of its advantages, as opposed to what is regarded as the overly rigid structure of the Horizon programme

120. The Rapporteurs would also like to touch, albeit summarily, upon another aspect of naval

cooperation which they had occasion to encounter in the course of preparing this report. The Birmingham Declaration of the WEU Council of Ministers, dated 7 May 1996, stated, in the section dealing with our own Organisation's operational development, that "Ministers welcomed the decision of the UK Government to make its Operational Sea-Training facilities available to WEU for national or collective use by WEU nations".

121 The Declaration noted that shared use of these types of facilities could improve military cooperation among WEU nations and invited other WEU nations to make similar offers, taking into account work in progress on multinational task-sharing

122 The Rapporteurs visited the Flag Officer Sea-Training (FOST) at Devonport who is answerable to the Commander-in-Chief of the Fleet for training the surface ships of the Royal Navy and Royal Fleet Auxiliary and their embarked air assets to meet prescribed operating and performance standards. As well as going to sea for a training exercise and observing the extremely efficient way evolutions were carried out under the command of Rear Admiral R. J. Lippett, the Rapporteurs also had the opportunity of paying a visit to a land-based facility providing training for dealing with natural disasters, with facilities apparently unique in Europe.

123. The possibility of naval cooperation over training, especially when various systems and indeed even hulls have been subject to common procurement, is one to which serious thought should be given by WEU and by its member countries. An initiative in this direction should be taken by the Organisation to develop its operational role by taking advantage of existing facilities, particularly when they have been already declared as available for WEU's use. This subject may well be further developed in a subsequent report for the Assembly

124. In conclusion, and given the current Greek Presidency of WEU, your Rapporteurs also wish to draw the attention of members of the Assembly to recent developments in the Hellenic Navy. Building on successful cooperation in recent years with the Netherlands, the Greek Ministry of Defence has now developed a very timely joint programme with Germany for the provision of


¹² Assembly Document 1419 on *The European armaments agency – reply to the 39th annual report of the Council*, Rapporteur Mr Borderas.

four MEKO A-200 frigates two built and already commissioned, two currently being built in Greek yards. In parallel a modernisation programme for the Hellenic Navy's German-built T-209 submarines is also in progress.

125 Together with a series of other new builds (5 LSTs, 2 further SSKs and 4 patrol boats) these recent acquisitions are giving Greece a well-balanced navy which could serve as a useful model for others. The fact that Greece has been able to build on its long-standing participation in NATO's Standing Naval Force Mediterranean (STANAVFORMED) by taking part in exercises organised by the Euromarfor countries (France, Italy, Portugal and Spain) all bodes well for the future. Indeed the expansion of Euromarfor to

other willing participants such as Greece would be a very positive development especially as that organisation's *raison d'être* runs parallel to WEU's commitment to the so-called Petersberg tasks.

126 Your Rapporteurs make no apology for ending the present rather technical report on a more political note: quite the contrary, in fact, because the more political cooperation we have between our member states in Europe, the greater need there will be for multinational practical co-operation also at sea, onshore and in the air. And the more necessary it will become to cooperate in both technical and industrial terms in order to equip our forces with the most cost-effective, interoperable materiel available.

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